



Department of Natural Resources
Division of Water Protection and Soil Conservation
Water Pollution Control Program
Basin Plan Facts

Lake Taneycomo and Bull Shoals Lake Basins – 11010003



Basin Description

Lake Taneycomo and Bull Shoals Lake lie within the White River Basin, which covers a large part of southern Missouri and northwest Arkansas. These lakes are protected for livestock watering, aquatic life, whole body contact recreation, boating, and drinking water supply. In addition, Lake Taneycomo is classified as a cold water fishery. The Lake Taneycomo watershed is estimated at 93% forest, 4% pasture, and 3% urban. The Bull Shoals Lake Basin is estimated at 85% forest and 15% pasture.

The surface of these watersheds, except for a few ridge tops, is composed of Jefferson City-Cotter dolomite. The Northview Shale, an important aquitard in the Springfield area that protects the deep aquifer from surface contamination, is absent in this basin. Although the Jefferson City-Cotter contains less karst terrain (land characterized by sinkholes, losing streams, caves and springs) the absence of an aquitard means contaminated surface water can move directly into groundwaters, making aquifers underlying the watershed extremely susceptible to contamination. (<http://www.conservation.state.mo.us/fish/watershed/whriver/geology/390getxt.htm#gefg2>)

After the opening of Table Rock Dam in 1958, its associated cold water release created what seemed to be an ideal trout stream. Only after the initially stocked Rainbow and Brown trout grew to appreciable size was the lake's trophy-producing potential realized. Today, the 1730-acre Lake Taneycomo is one of the most acclaimed trout fisheries in the state. Bull Shoals Lake is a large reservoir completed in 1952 by

the Army Corp of Engineers. The lake covers approximately 45,000 acres and has approximately 740 miles of shoreline. The upper 9,000 acres of Bull Shoals lies in Missouri, and the remainder lies in Arkansas.

Water Quality Concerns

The waters in this basin are affected by both point source and nonpoint source pollution. Point source pollution is a discharge of contaminants from a single location such as a wastewater treatment plant. Individual wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. Increasing human population increases the volume of point source wastewater discharged to streams and lakes. Point source discharges to the streams and lakes in this basin have become significant due to the large population growth in the Branson area, where development has raised the population of Taney County by 33% from 1990 to 1997.

<http://www.conservation.state.mo.us/fish/watershed/whriver/landuse/390lut08.htm>

There are presently 67 permitted wastewater treatment facilities in the Lake Taneycomo- Bull Shoals Lake basin. Wastewater discharge to Lake Taneycomo and its tributaries totals 12.67 million gallons per day (MGD), and the wastewater discharge from Missouri sources to Bull Shoals Lake and tributaries totals 0.93 MGD. The largest discharges to Lake Taneycomo are the Branson wastewater treatment plants, contributing 69% of all wastewater discharged to the lake. The largest Missouri discharge to Bull Shoals is the wastewater treatment plant at Ava which contributes about 48% of all wastewater flow to the lake originating in Missouri.

The major contaminants associated with point source discharges are; 1) nitrogen and phosphorus which can stimulate excess algae growth in streams and lakes, 2) bacteria, which can be a threat to swimmers and 3) biological oxygen demanding substances (BOD). BOD is a measure of organic materials in the water that may remove dissolved oxygen from the stream or lake and stress aquatic life.

Nonpoint source pollution is waste that is not released from a specific, identifiable point, but from numerous points that are spread out and difficult to identify and control. Significant nonpoint sources would include stormwater runoff from cattle pastures and dairies and stormwater runoff from urban areas. Major pollutants from these sources include nitrogen, phosphorus, sediment, and bacteria. Urban runoff can carry heavy metals or toxic organics. Other potential nonpoint sources also include sedimentation from erosion in disturbed watersheds, sludge application from sewage treatment facilities, stormwater runoff from mining sites, and seepage from septic tanks. Continuing urban and suburban development in the watershed will increase sewage loads and stormwater runoff problems in these lakes and area streams. Because of the rapid pace of development and steep slopes in the Branson area, soil erosion associated with land clearing for development is one of the largest nonpoint source problems in this area of the Lake Taneycomo watershed.

Table 1: Summary of water quality data for Lake Taneycomo, 1977-1987 vs. 1988-1998*

Measured Variable	Time Period	Mean	Standard Deviation	Number of Samples
Dissolved Oxygen (DO) mg/l	1977-1987	8.91	2.40	125
	1988-1998	9.43	2.09	54
DO % Saturation mg/l	1977-1987	78.93	19.83	126
	1988-1998	79.65	21.25	54
Fecal Coliform (FC) Colonies/100ml	1977-1987	27.34**	5.47**	131
	1988-1998	18.27**	3.59**	54
Total Dissolved Solids (TDS) mg/l	1977-1987	135.40	15.91	53
	1988-1998	123.86	24.42	43
Total Suspended Solids (TSS) mg/l	1977-1987	4.66	6.34	119
	1988-1998	7.18	7.78	40
Sulfate (SO₄) mg/l	1977-1987	8.143	4.75	35
	1988-1998	10.733	8.39	15
Nitrate (NO₃) mg/l	1977-1987	0.444	0.214	121
	1988-1998	0.462	0.177	52
Ammonia (NH₃) mg/l	1977-1987	0.053	0.115	113
	1988-1998	0.028	0.043	52
Total Phosphorus (TP) mg/l	1977-1987	0.045	0.103	123
	1988-1998	0.023	0.023	52
Chloride (CL) mg/l	1977-1987	6.35	3.95	37
	1988-1998	6.38	2.55	16

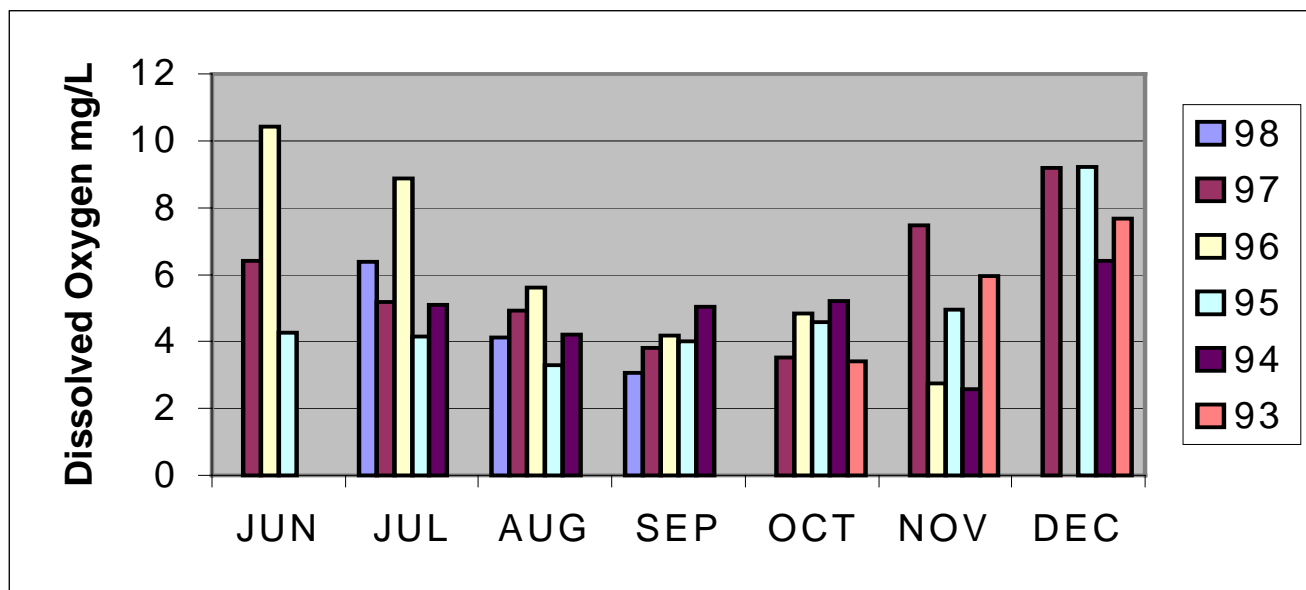
* Water quality changes between time periods are statistically insignificant

**Calculations based on geometric mean

In addition to these traditional water pollution sources, Lake Taneycomo has been affected by dams. Hydropower generation at Powersite Dam in Forsyth results in fluctuating water levels. These fluctuations cause aesthetic problems. when water levels in Lake Taneycomo are low. This problem is most apparent in the Rockaway Beach area, which consistently has problems with odor and sediment along the shoreline, impacting residents, local businesses, and tourism.

The single largest impact on Lake Taneycomo can be traced to the creation of Table Rock Dam. Table Rock dam greatly decreased the amount of sediment flowing into Lake Taneycomo and provided a large supply of cold water which allowed the development of an important trout fishery in Taneycomo. But the cold water released from Table Rock Lake is also low in dissolved oxygen in late summer and fall. During this critical period, the Army Corps of Engineers injects liquid oxygen into water flowing through Table Rock dam to increase dissolved oxygen levels in Lake Taneycomo. The state standard for dissolved oxygen in Lake Taneycomo, a cold water fishery, is a minimum of 6 mg/L. Frequently during late summer and fall, neither this limit nor the 4 mg/l management target set by the Corps of Engineers is met (see Figure 1).

Figure 1. Average daily dissolved oxygen minimum in Lake Taneycomo 1993-1998



Maintaining a viable trout fishery in Lake Taneycomo will be challenging. In recent years the major complaint from fishermen has been the small size of the average fish being caught. The major reason for small trout size in Lake Taneycomo appears to be high fishing pressure. Most trout are caught within a few months of being released from the hatchery and thus have had little time to grow. Lack of an adequate food base for the number of fish being stocked in Taneycomo and periodic low dissolved oxygen levels are probably both adversely affecting trout growth.

WATER QUALITY MANAGEMENT

Water quality management activities by the Corps of Engineers and the hydropower operating authorities for Table Rock and Powersite dams include injecting dissolved oxygen into water released from Table Rock dam during critical periods and attempting to regulate water levels and flows through Lake Taneycomo to minimize aesthetic problems.

Excess phosphorus is a cause of eutrophication, the nutrient enrichment of an aquatic ecosystem that promotes the growth of algae. Concern about eutrophication in Lake Taneycomo has prompted DNR officials to impose specific effluent limitations on point source discharges to Lake Taneycomo and tributaries. This regulation states that discharges to the Lake Taneycomo watershed shall not exceed 0.5 mg/l of phosphorus as a monthly average. Only small wastewater treatment facilities (less than 0.0225 MGD) that were in existence prior to this rule and do not increase in size are excluded from these phosphorus limits.

Related Sites

Missouri Department of Conservation – Missouri's Rivers and Their Watersheds

<http://www.conservaion.state.mo.us/fish/watershed/>

United States Geologic Survey – Water Use in the United States

<http://water.usgs.gov/watuse/>

United States Geologic Survey – Ozark NAWQA Study

http://water.usgs.gov/nawqa_home.html

CARES Watershed Information Clearinghouse – Water Resource Atlas

<http://www.cares.missouri.edu/cwic/mowater/mowater10.html>

Colder than normal temperatures and low dissolved oxygen levels in these releases, mainly in the summer and fall, have been blamed for stressing fish and are thought to have been the cause of fish kills in some tailwaters (Spotts 1991).

Temperature stress and low dissolved oxygen or other water quality problems associated with hydropower generation have been associated with at least 16 fish kills in the Bull Shoals tailwaters (Spotts 1991). MDC WEBSITE